Laboratory miniature dispenser-bioassay to evaluate the compatibility of powder compounds in the entomovectoring with *Bombus terrestris*

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The application of new plant protection strategies such as the entomovector technology (Mommaerts et al., 2011) demands the design of an appropriate bioassay in order to guarantee pollinator safety. Indeed in the context of the entomovector technology vectors such as bumblebees of *Bombus terrestris* are exposed to powder formulations containing the active ingredient which they need to disseminate into the target crop.

In this study we report on the development of a miniature dispenser (MD)-test allowing to evaluate lethal and sublethal side-effects of powder formulations of (bio)pesticides. Five model compounds were used: Prestop-Mix, Signum, kaolin, wheat flour and cellulose. Following a tier approach, the products were first placed in a one-way MD connecting a microcolony and an empty nest box containing the food. So workers walked through the powder product when leaving the nest in search for food and when returning back to their nest. Second, a two-way MD-test was conducted where the setup was similar to the one-way MD-test except that workers returned to their nest with food via another route free of exposure to the powder product. Third, the second setup was extended with a flight cage instead of an empty box. Finally, the flight cage was replaced by a greenhouse compartment to assess the side-effects under more field-related conditions with queen-right hives.

In general, the results demonstrated that the two-way MD-bioassay provides a reliable assessment of hazards of powder formulated products. For example severe toxicity was observed for the carrier kaolin as 89% of the workers were dead after 5 week, whereas for the other 4 products mortality was below the IOBC threshold of mortality (<25%). This toxicity profile was in agreement with the results obtained from the higher tier experiments. Furthermore, data confirmed that cellulose can be used as a negative control, while kaolin as a positive, in future risk assessment experiments.

References

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